BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification.	Rulemaking 18-12-006 (Filed December 13, 2018)

COMPLIANCE FILING OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E), SOUTHERN CALIFORNIA EDISON COMPANY (U 338 E) AND PACIFIC GAS AND ELECTRIC COMPANY (U 93 E) PURSUANT TO ORDERING PARAGRAPH 2 OF DECISION 16-06-011

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April 1, 2020

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OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification.	Rulemaking 18-12-006 (Filed December 13, 2018)

COMPLIANCE FILING OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E), SOUTHERN CALIFORNIA EDISON COMPANY (U 338 E) AND PACIFIC GAS AND ELECTRIC COMPANY (U 93 E) PURSUANT TO ORDERING PARAGRAPH 2 OF DECISION 16-06-011

San Diego Gas & Electric Company ("SDG&E"), Pacific Gas and Electric Company ("PG&E") and Southern California Edison Company ("SCE") hereby file[1] their Electric Vehicle Charging Infrastructure Cost Report as required by Ordering Paragraph 2 of Decision ("D") 16-06-011.[2] The report is attached to this pleading.

Respectfully Submitted,

/s/ E. Gregory Barnes

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[1] Pursuant to Commission Rule 1.8(d), PG&E and SCE have authorized SDG&E to file the attached compliance report on their behalf.

[2] D.16-06-011 issued in Rulemaking ("R.") 13-11-007. R.18-12-006 (at 1) states that it is the "successor proceeding" to R.13-11-007. R.18-12-006, *Assigned Comm'r's Scoping Memo and Ruling* (May 2, 2019) at 18, ¶ 9, directs the respondent utilities to continue filing the subject reports as provided by D.16-06-011. The *Administrative Law Judge's Ruling Amending Load Research Report Deadline for 2020 and Beyond* (January 6, 2020) at 3, directs filing the reports "on March 31 of the given reporting year" going forward. Based on guidance from Commission Energy Division, the title of the attached report has been changed from the "Load Research Report" used in earlier reports.

Joint IOU Electric Vehicle Charging Infrastructure Cost Report 8th Report[1] Filed on April 1, 2020

[1] The prior seven reports were named "Joint IOU Electric Vehicle Load Research Report". Per Energy Division's guidance, the name is changed starting this year.

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I. Executive Summary

On July 25, 2011, the California Public Utilities Commission (CPUC or Commission) issued Decision (D.)11-07-029 (the Phase 2 Decision) in the Alternative-Fueled Vehicle Order Instituting Rulemaking (R.) 09-08-009 (AFV OIR), to evaluate policies and develop infrastructure sufficient to overcome barriers for the deployment and use of Plug-in Electric Vehicles (EV) in California. The Phase 2 Decision ordered California's investor-owned utilities (IOUs), which includes Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison Company (SCE), to conduct research to examine EV customer charging behavior, as well as track service and distribution system upgrade costs related to EV load. The IOUs filed the first Joint IOU Electric Vehicle Load Research Report (Load Research Report) in December 2012. D.13-06-014, issued July 3, 2013 (the First Extension Decision), extended the research for an additional three years[2] with reports to begin in December 2013.[3] The First Extension Decision also directed the Energy Division to work with stakeholders to revise the load research methodology.[4] D.16-06-011, issued on June 13, 2016 (the Second Extension Decision), extended the interim policy of treating the residential electric vehicle charging costs that exceed the allowances in the Electric Rules 15 and 16 of the three IOUs as common facility costs for another three years, to June 30, 2019.[5] In addition, the annual filing requirement of the Load Research Reports was extended by another three years.

In December 2018, the Order Instituting Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification (DRIVE OIR, R.18-12-006) directed Energy Division staff to consider "whether Load Research Reports include all relevant data and whether or how to direct the IOUs to continue filing Load Research Reports".[6] The subsequent Scoping Memo, issued May 2, 2019, directed the IOUs to incorporate cost data related to EV infrastructure upgrades for commercial customer sites in the 2020 report and extended the interim treatment for Electric Rules 15 and 16 allowances to December 31, 2019.[7] An ALJ Ruling as part of R.18-12-006 extended the interim treatment policy once again to December 31, 2020. Throughout 2019, the IOUs worked closely with Energy Division staff to determine how to report commercial EV infrastructure upgrade costs and how else to revise the report per the DRIVE OIR. On November 5, 2019, the IOUs sent a letter to CPUC Executive Director requesting permission to delay the filing of the 2020 report from January 31, 2020 to March 31, 2020 and to adjust the content of the report. The extension request was approved by an ALJ's Ruling on January 6, 2020.[8]

This 2020 IOU EV Charging Infrastructure Cost Report (Report) is the outcome of extensive discussions with Energy Division staff to revise the Load Research Report to a more streamlined format and include a useful cost data reporting structure. Under the direction of Energy Division, the Report no longer

[2] D.13-06-014, p. 15.

[3] D.13-06-014, Ordering Paragraph 4.

[4] D.13-06-014, Ordering Paragraph 3.

[5] D.16-06-011, Ordering Paragraph 2.

[6] R.18-12-006, Order Instituting Rulemaking to Continue the Development of Rates and Infrastructure for Vehicle Electrification and Closing Rulemaking 13-11-007, December 19, 2018, p. 15

[7] R.18-12-006, Assigned Commissioner's Scoping Memo and Ruling, May 2, 2019, p. 18

[8] R.18-12-006, Administrative Law Judge's Ruling Amending Load Research Report Deadline for 2020 and Beyond, January 6, 2020, p.3. The ALJ Ruling approves filing the report on March 31 of the given reporting year going forward.

includes the load impact portion of the former Load Research Report and newly includes additional cost data. The IOUs will continue to work closely with Energy Division to adjust the content and format of future reports as necessary based on feedback.

This report includes data through December 2019 for residential and commercial EV project cost, service line and distribution system upgrades, and the current EV adoption forecasts of each IOU, all of which are discussed in further detail in the following sections. It is important to note that the EV market is still evolving. New vehicle models, vehicle battery sizes, charging levels, charging equipment, and charging services are continually entering the EV market. EV manufacturers and charging providers are also leaving the market. This evolution affects adoption, charging demand, and infrastructure costs and is expected to continue in the near term as the EV market grows and matures.

II. Revised 2020 IOU EV Charging Infrastructure Cost Report

Since 2011, the IOUs have filed annual Load Research Reports focused on residential EV customer charging behavior and service and distribution system upgrade costs related to residential EV load. The reports were over one hundred pages long and took significant time and resources to compile each year. While the load research data reported was illustrative of the behaviors of EV customers, it was ill-suited for drawing conclusions for policymaking due to the nascency of the EV market, the limited customer count on a separately-metered rate, and the difficulty in disaggregating EV load from other loads on whole-house electric rates. Therefore when the DRIVE OIR and Scoping Memo directed Energy Division staff to consider "whether Load Research Reports include all relevant data and whether or how to direct the IOUs to continue filing Load Research Reports"[9] and to incorporate cost data related to EV infrastructure upgrades for commercial customer sites in the 2020 Load Research Report, Energy Division staff initiated a broader discussion on how to improve the Load Research Reports' utility going forward.

Since May 2019, the IOUs collaborated with Energy Division staff to revise the Load Research Report into a more useful cost data reporting structure. The renamed IOU EV Charging Infrastructure Cost Report includes the following revisions:

- Addition of a standard template for IOUs to report program and non-program infrastructure costs, EV forecast, and historic residential infrastructure upgrade costs
- Elimination of load data
- A shortened written report to provide context for the spreadsheet template including each IOU's cost data
- Addition of commercial upgrade costs related to IOU programs and non-program infrastructure

The Report provides a consolidated summary of costs for residential and non-residential infrastructure and upgrades related to electric vehicles for all three IOUs. This includes utility-side and customer-side costs for projects in the IOUs' infrastructure pilots and programs as well as utility-side infrastructure upgrades provided through the utility's traditional service delivery. The Report consists of this written portion with background and context for the data and a spreadsheet template for each IOU's cost data. The template includes actual and forecasted EV adoption for light-, medium-, and

[9] R.18-12-006 pg. 15

heavy-duty electric vehicles in each IOU service territory (Table 1 of each attachment). The template also includes infrastructure site costs, support activity costs, and charger installation information, categorized by site type and size, for all projects in the IOU's pilot and program portfolio (Table 2 of each attachment). Utility-side infrastructure site cost information is reported for all non-program related projects (i.e., projects through the utility's traditional service delivery) for residential and non-residential sites (Table 3 of each attachment). Lastly, the template also includes historical residential upgrade costs from previously submitted Load Research Reports (Table 4 of each attachment). The IOUs may use this report to holistically assess costs associated with EV infrastructure in their service territories in residential and commercial sectors and through programs and traditional service delivery. This may help illustrate costs for different sectors and sites and inform plans for future infrastructure to support transportation electrification.

It is important to note that because the revisions to the Load Research Report, which expanded the scope of reporting to commercial costs, were not finalized until late 2019, the IOUs may need to revise processes and cost tracking structures for specific costs requested in the template. Some IOUs may not be able to report all the data required in the template in this initial Report. The IOUs have noted in the template and in the sections when and why cost data may not be available to report and provide explanations for content that will be included in future reports. As stated above, the IOUs will continue to work with Energy Division staff to further refine the Report.

III. Background

California has ambitious climate and air quality goals that will require broad electrification of passenger vehicles and fleets. This includes Governor Brown's issued Executive Order (E.O.) B-48-18 that increases the State's target to five million ZEVs on the road by 2030 and requires installation of 250,000 public charging stations, including 10,000 direct current fast charging stations in operation by 2025. The IOUs are required by Senate Bill 350 to support these goals and widespread adoption of transportation electrification in general. Additionally, lack of access to infrastructure is a well-established barrier to transportation electrification (TE) and the IOUs have and will continue to play a critical role in TE infrastructure deployment through strategically-designed rate-payer funded programs or the IOUs' core business of delivering electricity.

The CPUC opened the AFV OIR, to consider alternative-fueled vehicle tariffs, infrastructure, and policies to support California's greenhouse gas emissions reductions goals. The Phase 2 Decision of the AFV OIR determined EV load as new and permanent under Electric Rules 15 and 16 and adopted the interim policy of treating the residential EV charging costs that exceed the allowances in Rules 15 and 16 as common facility costs, a policy that has been extended through 2020. To continue to inform such policies, the IOUs have filed annual Load Research Reports as directed by the Phase 2 Decision and will continue to do so with this new Report. Tracking the costs associated with EV infrastructure deployment and upgrades is valuable in understanding the barriers a customer may face in electrifying based on sector or site type. Understanding the difference in EV infrastructure costs between IOU programs and traditional service delivery may provide additional insight into challenges and third-party providers of behind the meter infrastructure. One limitation of this report is that it primarily only includes utility-incurred costs. Costs that are incurred by the customer but are unknown to the utility are required for deploying EV

infrastructure but may not be accounted for in this report. One example of this type of cost is the trenching and site excavation for service line extensions, costs that are not utility service facilities under Rules 15 and 16 and are therefore borne by customers and not tracked by the utility. Such costs are not included in this report. In addition to other costs, trenching and site excavation are typically borne by the utility in incremental IOU TE programs, making a like-like comparison between the costs of IOU TE programs and traditional delivery challenging.

Table 1: Summary of Upgrade Costs and Responsibilities

	Customer Assigned Costs	Allowance?	Utility Assigned Costs
Equipment on Customer Side of Meter	Customer pays all costs for charging equipment, including costs to plan, design, install, own, maintain, and operate facilities and equipment beyond the Service Delivery Point		
Service Line Upgrade	• Excavation: trenching, backfilling, and other digging as required including permit fees • Furnishing, installing, owning, and maintaining all Conduits (including pulling tape) and Substructures, furnishing riser materials • Protective Structures: Furnishing, installing, owning, and maintaining all necessary Protective Structures as specified by utility for utility's facilities	Yes, to cover work responsibility assigned to utility. Customer pays amount exceeding allowance. This is in addition to Customer assigned costs. Note: CPUC policy exemption in place through December 2020 for residential upgrades when EV load is added. Under exemption, amount exceeding allowance is not paid by customer and instead paid by utility and recovered through distribution rates.	• Underground Service: service conductors and connectors • Overhead Service: conductors and support poles • Metering: meters and associated utility-owned metering equipment
Secondary Lines/ Transformer Upgrade (serving 2 or more Service Lines)			Utility pays all costs for upgrading and maintaining the distribution system. Recovered through distribution rates.

The scale and cost of infrastructure deployment through programs and traditional service delivery will depend on the adoption of EVs in each IOU service territory. At the time of this report, March 2020, Go Electric Drive lists 50 EV models on its online EV showroom.[10] The IOUs estimate more than 534,081 EVs are on the roads in their service territories, as of December 31, 2019. The number of light duty and medium- and heavy-duty EVs forecasted to be operating in the IOUs service territories from 2020 through 2025 are:

Table 2: IOU EV Adoption Forecasts	**Light Duty EVs**			**Medium- and Heavy-Duty EVs**		
Year	**PG&E**	**SCE**	**SDG&E**	**PG&E**	**SCE**	**SDG&E**
2020	319,263	306,200	61,363	925	13,937	N/A
2021	401,393	423,559	74,341	1,481	18,617	N/A
2022	499,020	569,069	88,616	2,164	25,253	N/A
2023	615,833	787,605	104,320	3,146	31,769	N/A
2024	754,959	1,000,785	120,023	4,172	40,908	N/A
2025	917,959	1,213,531	137,297	5,743	50,974	N/A

Each IOU may use a different methodology to forecast EVs in their service territory. Details of the forecasts can be found in Table 1 of each IOUs' attachments submitted in conjunction with this report.

IV. Cost Tracking Data

A. Introduction

Cost tracking data are provided in Table (2) Pilot-Program Costs, (3) Non-Program Costs, and (4) Historic Residential Costs of the attached files. The IOUs have coordinated, to the extent possible, to provide consistency in the data assumptions. However, because utilities have different methods of tracking their costs, the costs calculated for each category may be based on different assumptions. For costs that cannot be included, each utility provides an explanation why certain data is unavailable to report. The utilities will continue to work with Energy Division to determine how we can streamline and improve the cost tracking process for future reports.

[10] www.goelectricdrive.org/you-buy/ev-showroom, data as of March 2020

B. PG&E's section

Table 2 in Attachment 1 : Pilot-Program Costs

a. General Approach and Cost Assumptions

- PG&E includes site costs for projects that were substantially completed[11] in 2019 in four programs – EV Charge Network, EV Fleet, and two Priority Review Projects (Medium-Heavy Duty Fleet Demonstration Project and Idle Reduction Project)

- PG&E records each project's site costs and uses the following definitions for utility side costs versus customer side costs:

    - Utility side costs - "to the meter" capital labor and contract construction costs, including design, permitting, materials, labor including trenching and

    - Customer side costs – "behind the meter" capital labor and contract construction costs, including design, permitting, materials, labor including trenching from the meter to the stub-out for the charging equipment.

- The methodology is the same for the recording of Light Duty, Medium- and Heavy-duty[12], and Priority Review Projects construction costs.

- "Site Costs" do not include project management costs and rebates.

    - The specific site costs of design, trenching, separate meters, and permitting are a subset of the total utility side costs and total customer side costs reported.

- "Support Activities" costs are reported for work done in the 2019 calendar year and are not tracked to specific project sites.

b. Explanation of why certain data is unavailable to report

- Design, trenching and site excavation, separate meter, and permitting costs are not separately recorded for utility side work and customer side work. As such, the provided costs are prorated between utility side costs and customer side costs based on overall program allocations.

- Additionally, trenching, separate meter, and permitting costs are not consistently separately recorded for each project site and often require manual extraction of the data from contractor submissions, as such for the Light Duty Vehicle Infrastructure:

[11] Substantially complete for light-duty vehicle infrastructure is defined as projects where all customer side or "behind the meter" (BtM) construction work is complete (excluding charger installation), and all utility side or "to the meter" (TtM) equipment is installed (excluding to the meter wire pulls or energization). Projects substantially completed in 2019 may include projects that in 2019 had not yet completed charger installation or site restoration.

[12] For medium and heavy-duty infrastructure, it is defined as when all the TtM and/or BtM construction done by the utility is complete.

- Actual trenching costs are reported for a subset of project sites (1 MUD site and 15 Non-residential sites)

- Costs of separate meters are estimated based on the number of meters installed at each project site and an estimated unit price for meter panels, associated equipment, and installation costs.

- Permitting costs are the costs of the labor to apply for the permit, but do not include the costs of the permits

- For Medium and Heavy-Duty Vehicle Infrastructure, the trenching costs and separate meter costs are separately recorded for each project site and the permitting costs include the cost of the permit itself and special inspections, but not the cost of the labor to apply for the permit.

- Site costs for PG&E's EV Fast Charge program are not available as the program launched in August 2019 and no infrastructure construction costs were incurred as of December 31, 2019.

- PG&E does not separately record distribution system upgrade costs or service line upgrade costs related to EV infrastructure installation through programs. Costs incurred to the utility for any work on the distribution system or service line in the programs are captured under total utility side costs.

- Site costs for medium and large sites for the Medium and Heavy-Duty Vehicle Infrastructure include only utility side costs as there was no infrastructure construction on the customer side of the meter in EV Fleet as of December 31, 2019.

c. Steps to report currently unavailable data at a later time

- PG&E is working to be able to provide more granular cost actuals for permitting, trenching, and separate meters for infrastructure constructed in 2020 by revising the process and structure of contractors' cost reporting and invoicing and tracking those specific cost components. This additional data may be included in future reports.

d. Explanation of plans to provide additional data in future reports

- PG&E and the other IOUs will continue collaborating with Energy Division staff to identify other costs of interest to include in future reports, including key cost drivers that may be identified during program deployment.

Table 3 in Attachment 1 : Non-Program Costs

a. General Approach and Cost Assumptions

- Upgrade costs related to EVs fall into three categories: 1) equipment on the customer side of the meter, 2) the individual customer service line, and 3) the utility distribution system that serves multiple customers.

- PG&E does not have information on the customer side of the meter costs and limited insight on the customer assigned costs for service line upgrades, which includes costs over the Rule 16 allowance.

- The methodology is the same for the recording costs of both residential and commercial charging infrastructure non-program work.

- PG&E separately estimates and records the costs of specific work types of design, trenching, separate meters, permitting, distribution system work (under Rule 15), and service line work (under Rule 16).

    - For this Report, the estimated total costs for the specific work types listed above may include costs assigned to the customer and to the utility.

- Total utility and customer costs are defined as:

    - Total Utility costs –estimated "to the meter" costs assigned to the utility including design, trenching (as part of any grid betterment work), separate meters, permitting, distribution system costs (under Rule 15), service line costs (under Rule 16), grid betterment work triggered by the project, and the allowance under Rule 16.

    - Total Customer costs – estimated "to the meter" costs above the Rule 16 allowance assigned to the customer and any costs for work assigned to the customer but performed by the utility (e.g. service line trenching, backfilling, and other digging as required including permit fees; furnishing, installing, owning and maintaining all conduits and structures, including riser material, and all rights of way costs, if applicable).

        - Included as part of the customer costs where applicable are those items considered "non-refundable" including but not limited to excess service, risers, inspection and permits as outlined in the Rule 15 & 16 tariff.

        - While costs over the Rule 16 allowance for residential infrastructure are covered by the utility per the residential policy exemption, the total costs are reported as a proxy of what would have been assigned to the customer.

    - Cost totals for specific work types of design, trenching, separate meters, permitting, distribution system work (under Rule 15), and service line work (under Rule 16) are estimated costs included in customer contracts and are used to calculate the total utility side costs.

b. Explanation of why certain data is unavailable to report

- PG&E is not able to easily separate costs assigned to the utility or the customer under the same work type (e.g. Rule 16), especially if the utility performed work on behalf of the customer but assigned to the customer.

- PG&E does not separately track ongoing maintenance or support activities for EV-specific work orders; those costs are part of general new business and/or customer requested modification work orders and cannot be reported for a specific subset of projects.

- PG&E has not previously tracked residential or commercial port counts and/or kilowatt (kW) amounts.

c. Steps to report currently unavailable data at a later time

- PG&E does not yet have the ability to capture information on residential or commercial port counts and/or kW amounts but is continuing to explore ways to systematically capture this information for future reporting periods.

d. Explanation of plans to provide additional data in future reports

- PG&E and the other IOUs will continue collaborating with Energy Division staff to identify other costs of interest to include in future reports, including key cost drivers that may be identified in the future.

Table 4 in Attachment 1 : Historic Residential Costs

a. General Approach and Cost Assumptions

- All historic residential costs are pulled from data used in previously submitted Load Research Reports.
    - The process to report utility distribution and service line costs for this Report is different than for previous Load Research Reports and may make a comparison between tables challenging.

- As mentioned in the section on Table 3 of attachment 1, upgrade costs related to EVs fall into three categories: 1) equipment on the customer side of the meter, 2) the individual customer service line, and 3) the utility distribution system that serves multiple customers.

- PG&E does not have information on the customer side of the meter costs nor insight on the customer assigned costs for service line upgrades.
    - The Customer pays all costs for beyond the Service Delivery Point.
    - The Customer is responsible for trenching, backfilling, and other digging as required including permit fees.
    - The Customer is responsible for furnishing, installing, owning and maintaining all conduits and structures, including riser material.
    - The Customer is responsible for all rights of way costs, if applicable.

- Per the CPUC policy exemption currently in place through December 31, 2020, when the Rule 16 costs exceed the allowance provided for residential EV service line upgrades, the amount

exceeding the allowance is not paid by the customer, but instead by PG&E (recoverable through distribution rates).

b. Explanation of why certain data is unavailable to report

- N/A

c. Steps to report currently unavailable data at a later time

- N/A

d. Explanation of plans to provide additional data in future reports –

- PG&E will work with Energy Division and the other IOUs to determine how future historical (I.e. reporting periods 2019 and beyond) will be organized on future reporting templates.

C. SCE's section

Table 2 in Attachment 2 : Pilot-Program Costs

a. General Approach and Cost Assumptions

- SCE records each project's site costs in separate work orders for:
    - Utility-side costs ("to the meter" capital labor and contract construction costs, including design, trenching, permitting, etc.) and
    - Customer-side costs ("behind the meter" capital labor and contract construction costs, from the meter to the stub-out for the charging equipment).
- The methodology is the same for the recording of Light-, Medium- and Heavy-duty, and Priority Review Projects (Port of Long Beach and Transit Bus) construction costs.
- "Site Costs" do not include Operation and Maintenance "O&M" expense and rebates.
- Rebate costs are included under "other costs" in "Support Activities."

b. Explanation of why certain data is unavailable to report

- SCE does not report site-specific meters and related installation costs as all meters are recorded in mass plant and capitalized when they are delivered to the warehouse. As such, recording meters to site-specific work orders would be a complicated manual process to calculate vintage, unit cost, depreciation, cost of removal, and book/tax depreciation differences upon installation, and to manually adjust SCE's rate base calculation to avoid double recovery.
- Design, permitting, site excavation, and trenching costs are not recorded separately from customer-side costs and as such, the provided costs are estimated based on overall program allocations.
- Construction costs for SCE's Charge Ready Transport program are not available for the period of this report as the program launched in May 2019 and no construction costs were incurred as of December 31, 2019.
- SCE does not separately record distribution system upgrade costs or service line upgrade costs related to EV infrastructure installations.
- SCE does not track projected ongoing maintenance costs for utility-side infrastructure as a part of its program costs.
- SCE's large sites "Large Sites: >3 MW" include only utility-side costs, with no O&M or customer-side cost component.

c. Which data can be reported at a later time

- Charge Ready Transport construction costs will be included in the next report covering the 2020 period.

d. Steps to make certain data available for future reporting and status of those steps

- SCE has taken steps to ensure more detailed tracking of costs by creating separate work orders per site for utility-side costs, customer-side costs, and easements. Within these work orders SCE uses cost elements, cost descriptions, and purchase order information to further breakdown costs into additional subcomponents.

e. **Explanation of IOU plans to provide additional data in future reports**

- Charge Ready Transport data will be available in future reports.

Table 3 in Attachment 2 : Non-Program Costs

a. General Approach and Cost Assumptions

- The methodology is the same for recording both residential and commercial non-program work.
- SCE records project costs in a separate work order for:
- Utility-side costs ("to the meter").
- Customer-side costs ("behind the meter") are not available to SCE to report.
- Total Residential EV Customer Cost is the amount of excess Rule 16 costs that would have been due to SCE if the allowance exemption was not in place.
- Commercial EV Total Customer Costs reflect the invoiced amount the customer paid for its portion of the "to the meter" work order costs. This could include excess Rule 16 costs, utility-side permit costs, right-of-way-costs, etc.
- The permitting, site excavation, and trenching costs provided are estimated costs.

b. Explanation of why certain data is unavailable to report

- SCE captures design costs as allocated overhead and as such are unable to report this category separately.
- SCE does not report site-specific meters and related installation costs as all meters are recorded in mass plant and capitalized when they are delivered to the warehouse. As such, recording meters to site-specific work orders would be a complicated manual process to calculate vintage, unit cost, depreciation, cost of removal, and book/tax depreciation differences upon installation, and to manually adjust SCE's rate base calculation to avoid double recovery.
- SCE does not track projected ongoing maintenance costs for utility-side infrastructure as a part of its electric vehicle work order costs.
- Project Management, Customer Outreach, and Marketing and Education Materials are not separately tracked as part of general new business and/or customer requested modification work orders.

c. Which data can be reported at a later time

- SCE has not tracked charge ports or new capacity for non-program EV projects.

d. Steps to make certain data available for future reporting and status of those steps

- SCE is evaluating appropriate enhancements to existing systems and processes in an effort to capture this data.

e. Explanation of IOU plans to provide additional data in future reports

- See Table 4 in attachment 2, Section e response.

Table 4 in attachment 2 : Historic Residential Costs

a. General Approach and Cost Assumptions

- SCE pays all costs for upgrading and maintaining the distribution system when residential EV load is added (recoverable through distribution rates).
- Per the CPUC policy exemption currently in place through December 31, 2020, when the Rule 16 costs exceed the allowance provided for residential EV service line upgrades, the amount exceeding the allowance is not paid by the customer, but instead by SCE (recoverable through distribution rates).
- The Customer pays all costs for beyond the Service Delivery Point.
- The Customer is responsible for trenching, backfilling, and other digging as required including permit fees.
- The Customer is responsible for furnishing, installing, owning and maintaining all conduits and structures, including riser material.
- The Customer is responsible for all right-of-way costs, if applicable.
- SCE does not separately track distribution infrastructure checks related to EVs. The EV infrastructure check is accounted for only if an upgrade work order is opened.
- For upgrades that included both a distribution system upgrade and a service line upgrade (counted as one upgrade), SCE reported the total amount in the distribution system upgrade total.

b. Explanation of why certain data is unavailable to report

- N/A

c. Which data can be reported at a later time

- N/A

d. Steps to make certain data available for future reporting and status of those steps

- N/A

e. Explanation of IOU plans to provide additional data in future reports

- SCE will work with the Energy Division, as well as PG&E and SDG&E to determine how future historical (I.e. reporting periods 2019 and beyond) will be organized on future reporting templates.

D. SDG&E's section

Table 2 in Attachment 3 : Pilot-Program Costs

a. General Approach and Cost Assumptions

- Costs provided are the direct costs incurred in 2019 for completed sites.
- For SDG&E's Power Your Drive program, each project's site costs were recorded in separate work orders per construction site.
- Workplace site costs are listed under the Level 2 (L2) chargers - Non-Residential Light-Duty EV category. Costs charged to program-wide work orders have been allocated to the L2 Chargers - Multi-Unit Dwellings and L2 Chargers - Non-Residential LDV categories proportionally based on site specific work order charges in these categories.
- For the Priority Review Projects, each project's site costs were also recorded in separate work orders per construction site.
- SDG&E does not have any 2019 rebate costs for our approved infrastructure programs.

b. Explanation of why certain data is unavailable to report

- SDG&E is not able to report separately on meters and related installation costs as they are recorded in mass plant and capitalized when they are delivered to the warehouse. Meters are not recorded in project-specific work orders.
- All construction costs are included in the utility side costs. SDG&E has not historically tracked utility side costs and customer side costs separately. SDG&E solicits fixed bids for combined utility and customer side costs per site. Bids for each site may be awarded individually or as bundled packages.
- Construction costs for SDG&E's MD/HD program are not available as no construction costs were incurred as of December 31, 2019.
- SDG&E does not separately record distribution line extension costs or service extension costs related to EV infrastructure installation.
- SDG&E does not track projected ongoing maintenance costs for utility-side infrastructure as a part of its program costs.
- SDG&E does not have sites larger than 500 kW at this time for its Medium and Heavy-Duty EV Infrastructure Program (MD/HD Program).

c. Which data can be reported at a later time

- SDG&E MD/HD Program construction costs will be available to report in 2020.

d. Steps to make certain data available for future reporting and status of those steps

- SDG&E is evaluating various enhancements to implement in its existing cost tracking process to determine utility side costs versus customer side costs for recently approved future projects where the utility owns both sides. SDG&E expects that in the 2020 report, it will be able to estimate these costs as a result of the enhancements implemented in 2020.

e. Explanation of IOU plans to provide additional data in future reports

- Rebate data will be available once rebate costs are incurred.

Table 3 in Attachment 3 : Non-Program Costs

a. General Approach and Cost Assumptions

- The process to identify commercial EV-related service extensions conducted outside of SDG&E TE infrastructure programs was implemented partway through 2019. Therefore, some EV-related work performed in early 2019 may not have been identified as such and are not included in this report.
- Costs provided are based on cost estimates at time of job creation.
- Separate meter costs include only the meter material estimates.
- Total Utility side costs do not include estimated O&M expense.
- Total Customer costs include excess of allowance that is due, or would be due, to the utility.

b. Explanation of why certain data is unavailable to report

- The design, permitting, trenching and site excavation costs provided are not separately tracked as a part of SDG&E's cost estimating process.

c. Which data can be reported at a later time

- SDG&E has not tracked charge ports or new capacity for non-program EV projects but plans to put processes in place to capture this data in the future.

d. Steps to make certain data available for future reporting and status of those steps

- SDG&E is evaluating appropriate enhancements to existing systems and processes in an effort to capture this data.

e. Explanation of IOU plans to provide additional data in future reports

- SDG&E will work with the Energy Division staff and the other IOUs to determine how future historical data will be organized on future reporting templates.

Table 4 in Attachment 3 : Historic Residential Costs

a. General Approach and Cost Assumptions

- Costs are based on the former Load Research Report timing which did not match up to calendar year timing.
- SDG&E pays all costs for upgrading and maintaining the distribution system when residential EV load is added (recoverable through distribution rates).
- Per the CPUC policy exemption currently in place through December 31, 2020, when the Rule 16 costs exceed the allowance provided for residential EV service extensions, the amount exceeding the allowance is not paid by the customer but instead by SDG&E (recoverable through distribution rates).
- The Customer pays all costs for beyond the Service Delivery Point.
- The Customer is responsible for trenching, backfilling, and other digging as required including permit fees.
- The Customer is responsible for furnishing, installing, owning and maintaining all conduits and structures, including riser material.
- The Customer is responsible for all rights of way costs, if applicable.
- SDG&E does not separately track distribution infrastructure checks related to EVs. The EV infrastructure is accounted for only if a work order is opened and identified as an EV workorder.

b. Explanation of why certain data is unavailable to report

- N/A

c. Which data can be reported at a later time

- N/A

d. Steps to make certain data available for future reporting and status of those steps

- N/A

e. Explanation of IOU plans to provide additional data in future reports

- SDG&E will work with the Energy Division staff and the other IOUs to determine how future historical data will be organized on future reporting templates.

Attachment 1

Table 1

Number of EVs forecasted in IOU Service Territory

		Light-Duty	Medium/ Heavy Duty
Actual[1]	2011	2,985	
	2012	10,802	
	2013	28,412	
	2014	54,201	
	2015	81,269	
	2016	111,235	
	2017	150,659	
	2018	216,798	
	2019	274,356	
Forecasted[2]	2020	319,263	925
	2021	401,393	1,481
	2022	499,020	2,164
	2023	615,833	3,146
	2024	754,959	4,172
	2025	917,959	5,743
	2026	1,106,971	7,760
	2027	1,322,735	10,156
	2028	1,566,064	13,502
	2029	1,838,238	17,447
	2030	2,142,513	21,905

Notes:

[1] Actual LDV values are provided by the Electric Power Research Institute ("EPRI") on annual light-duty vehicle sales, based on third part registration data.

[2] Forecasted values from PG&E's 2020 EV adoption forecast (Dec 2019). PG&E's light-duty, medium and heavy-duty electric vehicles long-term forecast derives from PG&E's market and policy driven probabilistic EV model. The model integrates different scenarios meeting state's Zero-Emission goals (e.g. SB1014, Gov. Brown's EO-B-48-18). PG&E's 20-year forecast predicts electric vehicle population by class and segment (including rideshare vehicles), energy demand and hourly capacity forecast. It tracks electric vehicle sales in California (source: EPRI), market trends (source: BNEF, others) and includes current programs and regulations (CARB, CPUC, CEC). PG&E's leverages internal data and results from pilot programs directed by state Agencies and conducted in collaboration with other IOUs and vehicle manufacturers. PG&E's EV adoption forecast is subject to variables and assumptions regarding EV market demand, evolution and development that are outside PG&E's control and therefore the forecast is subject to significant uncertainty and should not be relied upon as point estimates for policy or planning beyond the current PG&E GRC and distribution planning periods.

Table 2

2019 EV-related Upgrade Costs		Pilot/Program Commercial Charging Infrastructure					
		Light Duty Vehicle Infrastructure			Medium and Heavy Duty Vehicle Infrastructure[2]		
		L2 Chargers - Multi-Unit Dwellings	L2 Chargers - Non-Residential LDV	DCFC - LDV [1]	Small sites: <500 kW	Medium Sites: 500 kW - 3 MW	Large Sites: >3 MW
Site Costs ($)	Design costs	$434,395	$1,974,370	$0	$65,640	$143,913	$13,771
	Trenching and site excavation	$14,343	$1,737,434	$0	$100,825	$231,305	$82,751
	Separate meter costs	$475,000	$1,760,000	$0	$122	$0	$0
	Permitting costs	$22,228	$64,974	$0	$900	$2,735	$0
	Total Distribution System Costs Incurred by Utility for Upgrades						
	Total Service Line costs Incurred by Utility for Upgrades						
	Total Utility side costs	$1,033,278	$5,957,039	$0	$275,662	$646,389	$213,548
	Total Customer side costs	$3,652,375	$15,478,897	$0	$568,637	$0	$0
	Projected ongoing maintenance costs for utility-side infrastructure	$26,890		$0	$48,768	$0	$0
Support Activities ($)	Project management	$3,761,151		$0	$17,380	$78,052	$0
	Customer outreach (labor)	$1,761,961		$5,280	$0	$1,509,754	$0
	Marketing and education materials	$166,991		$0	$0	$765,602	$0
Other	Total number of charge ports installed	310	1,311	-	30	52	18
	Amount of new capacity resulting from project (kW)	2,077	8,784	-	750	874	1,110

Key:	
	Data not available to report

Notes:

[1] Any site that has a DCFC, even if L2 chargers are also installed, will be captured in this DCFC group

[2] Medium and Heavy duty infrastructure is categorized by site size based on amount of new capacity resulting from each project

Table 3

2019 EV-related Upgrade Costs		Residential Charging Infrastructure	Non-pilot/program Commercial Charging Infrastructure
Site Costs ($)	Design costs	$31,258	$30,572
	Trenching and site excavation	$4,033	$1,230,952
	Separate meter costs	$609	$59,209
	Permitting costs	$0	$52,294
	Total Distribution System Costs Incurred by Utility for Upgrades	$0	$757,669
	Total Service Line costs Incurred by Utility for Upgrades	$10,137	$1,798,229
	Total Utility side costs	$466,787	$2,721,284
	Total Customer Costs	$5,649	$430,071
	Projected ongoing maintenance costs for utility-side infrastructure		
Support Activities ($)	Project management		
	Customer outreach (labor)		
	Marketing and education materials		
	Other costs		
Other	Total number of charge ports installed		
	Amount of new capacity resulting from project (kW)		

Key:	
	Data not available to report
	Data not available to report in 2019, but utilities will begin tracking for future reports

Table 4

		2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Historical Upgrade Costs[1]	Total Distribution System Costs Incurred by Utility for Upgrades	$ 282,719	$ 598,172	$ 1,476,647	$ 798,367	$ 404,236	$ 1,734,016	$ 927,375
	Total Service Line costs Incurred by Utility for Upgrades	$ 39,924	$ 69,380	$ 103,259	$ 41,377	$ 37,500	$ 27,706	$ 52,349
	Total Customer Portion of Utility Costs Covered by the exemption	$ 9,226	$ 34,125	$ 76,046	$ 19,669	$ 3,856	$ 3,983	$ 29,618

Notes:

[1] Historical upgrade costs are from data from previously submitted Load Research Reports. The data for the 2011 - 2012 report is from July 2011 through Oct 2012. The data for the next five reports and ending with the 2016-2017 report includes data from Nov - Oct of the following year. Data for the 2017-2018 report includes data from Nov 2017 through Dec 2018

Attachment 2

Table 1

Number of EVs forecasted in IOU Service Territory

		Light-Duty	Medium/ Heavy Duty
Actual	2011	1,736	
	2012	8,526	
	2013	21,892	
	2014	39,782	
	2015	58,782	
	2016	83,005	
	2017	114,382	
	2018	163,390	
	2019	210,140	
Forecasted	2020	306,200	13,937
	2021	423,559	18,617
	2022	569,069	25,253
	2023	787,605	31,769
	2024	1,000,785	40,908
	2025	1,213,531	50,974
	2026	1,483,859	62,148
	2027	1,803,202	74,133
	2028	2,098,471	86,507
	2029	2,423,105	99,571
	2030	2,775,292	113,189

SCE Comments:

- Actual LDV values are provided by the Electric Power Research Institute ("EPRI") on annual light-duty vehicle sales, based on third party registration data.

- SCE's forecasts for light-duty, medium and heavy-duty electric vehicles are derived from SCE's Clean Power and Electrification Pathway (Pathway 2045) models which support meeting the state's GHG goals from whole economy wide perspectives. The Pathways model is an economy-wide energy supply, demand, and GHG emissions accounting tool developed by Energy + Environmental Economics (E3) to conduct economywide GHG emissions modeling. PATHWAYS is used to evaluate long-term decarbonization plans to support GHG mitigation planning. The model tracks GHG emissions from California's supply and demand side choices and was used by the California Air Resources Board (CARB) to develop California's 2017 Climate Change Scoping Plan.

SCE' Pathway 2045 white paper, available at: https://www.edison.com/home/our-perspective/pathway-2045.html

See E3, PATHWAYS model, available at: https://www.ethree.com/tools/pathways-model/

Table 2

2019 EV-related Upgrade Costs		Pilot/Program Commercial Charging Infrastructure					
		Light Duty Vehicle Infrastructure			Medium and Heavy Duty Vehicle Infrastructure		
		L2 Chargers - Multi-Unit Dwellings	L2 Chargers - Non-Residential LDV	DCFC - LDV [1]	Small sites: <500 kW	Medium Sites: 500 kW - 3 MW	Large Sites: >3 MW
Site Costs ($)	Design costs	$ 400,908	$ 1,377,821	$ 166,233	$ 110,400	$ 57,651	$ -
	Trenching and site excavation	$ 100,371	$ 1,538,794	$ 441,507	$ 125,815	$ 418,410	$ -
	Separate meter costs	N/A	N/A	N/A	N/A	N/A	N/A
	Permitting costs	$ 37,722	$ 129,642	$ 15,641	$ 1,248	$ 4,178	$ -
	Total Distribution System Costs Incurred by Utility for Upgrades						
	Total Service Line costs Incurred by Utility for Upgrades						
	Total Utility side costs	$ 84,461	$ 847,883	$ 273,831	$ 165,036	$ 552,512	$ 2,392,236
	Total Customer Costs	$ 539,000	$ 3,046,257	$ 623,382	$ 237,463	$ 480,240	$ -
	Projected ongoing maintenance costs for utility-side infrastructure	N/A	N/A	N/A	N/A	N/A	N/A
Support Activities ($)	Project management	$ 81,333	$ 343,321	$ 39,733	$ 568,864	$ 104,536	$ -
	Customer outreach (labor)	$ 27,651	$ 108,524	$ 2,876	$ 138,424	$ 20,433	$ -
	Marketing and education materials	$ 49,090	$ 584,649	$ -	$ 728,031	$ 49,533	$ -
	Other costs	$ 7,333	$ 120,758	$ 372,000	$ 92,256	$ 115,989	$ -
Other	Total number of charge ports installed	33	182	14	7	23	24
	Amount of new capacity resulting from project (kW)	238	1,310	775	350	2,875	14,000

Key:	
	Data not available to report

IOU Comments:
1 Any site that has a DCFC, even if L2 chargers are also installed, will be captured in this DCFC group

Table 3

2019 EV-related Upgrade Costs		Residential Charging Infrastructure	Non-pilot/program Commercial Charging Infrastructure
Site Costs ($)	Design costs		
	Trenching and site excavation	$2,092	$117,859
	Separate meter costs		
	Permitting costs	$788	$3,851
	Total Distribution System Costs Incurred by Utility for Upgrades	$39,369	$543,539
	Total Service Line costs Incurred by Utility for Upgrades	$54,136	$194,221
	Total Utility side costs	$93,505	$737,760
	Total Customer Costs	$511	$59,612
	Other construction costs		
	Projected ongoing maintenance costs for utility-side infrastructure		
Support Activities ($)	Project management		
	Customer outreach (labor)		
	Marketing and education materials		
	Other costs		
Other	Total number of charge ports installed		
	Amount of new capacity resulting from project (kW)		1,826

Key:	
	Data not available to report
	Data not available to report in 2019, but utilities will begin tracking for future reports

IOU Comments: n/a

Table 4

		2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Historical Upgrade Costs[1]	Total Distribution System Costs Incurred by Utility for Upgrades	$4,268	$4,863	$9,373	$17,290	$2,984	$0	$1,845
	Total Service Line costs Incurred by Utility for Upgrades	$26,433	$43,586	$67,627	$76,000	$44,561	$17,152	$37,538
	Total Customer Portion of Utility Costs Covered by the exemption	$6,133	$12,704	$4,246	$4,885	$1,174	$375	$8,120

IOU Comments:

[1] Historical upgrade costs from previously submitted Load Research Reports. The data for the 2011 - 2012 report is from July 2011 through Oct 2012. The data for the next five reports and ending with the 2016-2017 report includes data from Nov - Oct of the following year. Data for the 2017-2018 report includes data from Nov 2017 through Dec 2018.

Attachment 3

Table 1

Number of EVs forecasted in IOU Service Territory

		Light-Duty	Medium/ Heavy Duty
Actual	2011		
	2012	2,125	
	2013	4,400	
	2014	11,500	
	2015	18,000	
	2016	22,040	
	2017	26,498	
	2018	34,833	
	2019	49,585	
Forecasted	2020	61,363	N/A
	2021	74,341	N/A
	2022	88,616	N/A
	2023	104,320	N/A
	2024	120,023	N/A
	2025	137,297	N/A
	2026	154,570	N/A
	2027	171,844	N/A
	2028	189,118	N/A
	2029	208,119	N/A
	2030	229,020	N/A

IOU Comments:

Light-Duty historical

Historical EV counts are based off the EV count communicated in the load research report for that year. This count may not reflect year end counts.

Light-Duty forecasts

SDG&E's EV forecast is the expected growth in the SDG&E service territory without the influence of SDG&E's EV programs at each year end. The forecasted vehicle count may be overstated due to a significant growth in EVs in 2018 and 2019.

Medium/ Heavy-Duty

SDG&E has not yet completed its Medium / Heavy-Duty EV forecast. SDG&E expects to have a forecast in the 2020 report.

Table 2

2019 EV-related Upgrade Costs		Pilot/Program Commercial Charging Infrastructure					
		Light Duty Vehicle Infrastructure			Medium and Heavy Duty Vehicle Infrastructure		
		L2 Chargers - Multi-Unit Dwellings	L2 Chargers - Non-Residential LDV	DCFC - LDV [1]	Small sites: <500 kW	Medium Sites: 500 kW - 3 MW	Large Sites: >3 MW
Site Costs ($)	Design costs	563,746	542,689		183,909		
	Trenching and site excavation	4,697,133	3,908,740		1,477,807		
	Separate meter costs						
	Permitting costs						
	Total Distribution System Costs Incurred by Utility for Upgrades						
	Total Service Line costs Incurred by Utility for Upgrades						
	Total Utility side costs	1,242,161	1,279,762		904,170		
	Total Customer Costs						
	Projected ongoing maintenance costs for utility-side infrastructure						
Support Activities ($)	Project management	57,621	55,362		46,097		
	Customer outreach (labor)	3,256	3,128		86,039		
	Marketing and education materials				4,050		
	Other costs	(187,582)	303,211		65,956		
Other	Total number of charge ports installed	300	242		107		
	Amount of new capacity resulting from project (kW)	2160	1742		2057		

Key:	
	Data not available to report

IOU Comments:
1 Any site that has a DCFC, even if L2 chargers are also installed, will be captured in this DCFC group

Table 3

2019 EV-related Upgrade Costs		Residential Charging Infrastructure	Non-pilot/program Commercial Charging Infrastructure
Site Costs ($)	Design costs		
	Trenching and site excavation		
	Separate meter costs	$1,491	$2,335
	Permitting costs		
	Total Distribution System Costs Incurred by Utility for Upgrades	$1,750	$53,369
	Total Service Line costs Incurred by Utility for Upgrades	$26,660	$587,201
	Total Utility side costs	$28,410	$640,571
	Total Customer Costs	$1,853	$1,882
	Other construction costs		
	Projected ongoing maintenance costs for utility-side infrastructure		
Support Activities ($)	Project management		
	Customer outreach (labor)		
	Marketing and education materials		
	Other costs		
Other	Total number of charge ports installed		
	Amount of new capacity resulting from project (kW)		

Key:	
	Data not available to report
	Data not available to report in 2019, but utilities will begin tracking for future reports

IOU Comments:

Table 4

		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Historical Upgrade Costs[1]	Total Distribution System Costs Incurred by Utility for Upgrades	4,089	0	0	0	0	0
	Total Service Line costs Incurred by Utility for Upgrades	27,952	0	1,876	2,326	2,009	15,113
	Total Customer Portion of Utility Costs Covered by the exemption	32,041	0	1,876	2,326	2,009	15,113

IOU Comments:
[1] Historical upgrade costs from previously submitted Load Research Reports